

CLAIMS

1. An exhaust gas purifying apparatus for trapping and burning PM, which comprises electrodes and an insulative honeycomb structure having a number of cell passages, characterized in that the electrodes make an electric field in said honeycomb structure, the electric field not being parallel to the direction of the cell passages of said honeycomb structure.  
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2. The exhaust gas purifying apparatus according to claim 1 characterized in that said electric field is at the angle of at least 45 degree to the cell passages of the honeycomb structure.  
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3. The exhaust gas purifying apparatus according to claim 1 characterized in that said honeycomb structure is a straight-flow type honeycomb structure.  
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4. The exhaust gas purifying apparatus according to claim 1 characterized in that said electrodes comprise an electric-discharge electrode at the upstream of the honeycomb structure.
5. The exhaust gas purifying apparatus according claim 1 characterized in that said honeycomb structure carries a PM oxidation catalyst.  
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6. The exhaust gas purifying apparatus according claim 5 characterized in that said PM oxidation catalyst is selected from the group consisting of  $\text{CeO}_2$ ,  $\text{Fe/CeO}_2$ ,  $\text{Pt/CeO}_2$  and  $\text{Pt/Al}_2\text{O}_3$ , and combination thereof.  
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7. The exhaust gas purifying apparatus according to claim 1 characterized in that said electrodes comprise a center electrode and an outer electrode surrounding the center electrode, and that said honeycomb structure is positioned between the center electrode and the outer electrode.  
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8. The exhaust gas purifying apparatus according to claim 1 characterized in that said electrodes comprise a mesh electrode on the upstream end of said honeycomb structure and an outer electrode around the circumference surface of said honeycomb structure.  
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9. The exhaust gas purifying apparatus according to claim 8 characterized in that said electrodes further comprise a second mesh electrode on the downstream end of said honeycomb structure, said second mesh electrode  
5 being electrically connected with the outer electrode.

10. The exhaust gas purifying apparatus according to claim 1 characterized in that said electrodes comprise a center electrode and an outer electrode surrounding the center electrode; that said honeycomb structure is  
10 positioned between said center electrode and said outer electrode; that said center electrode extends beyond the upstream end of said honeycomb structure; and that the radially inner area of said honeycomb structure has a lower gas-flow resistivity than that of the outer area  
15 thereof.

11. The exhaust gas purifying apparatus according to claim 10 characterized in that said radially inner area of the honeycomb structure has a perforated hole through the honeycomb structure.

12. The exhaust gas purifying apparatus according to claim 11 characterized in that the ratio of the diameter of said honeycomb structure to that of said  
20 perforated hole is 10: 1 to 2: 1.

13. The exhaust gas purifying apparatus according to claim 1 characterized in that said honeycomb structure has opposite outer surfaces, and that said electrodes  
25 comprise a pair of plate electrodes respectively placed on said opposite outer surfaces of the honeycomb structure.

14. The exhaust gas purifying apparatus according to claim 13 characterized in that the apparatus comprises two or more sets of said honeycomb structure and said  
30 pair of plate electrodes.

15. The exhaust gas purifying apparatus according to claim 1 characterized in that said honeycomb structure  
35 has two pairs of opposite outer surfaces; that said electrodes comprise two pairs of opposite plate

electrodes; and that each pair of the opposite plate electrodes is placed on each pair of the opposite outer surfaces of the honeycomb structure such that said two pairs of opposite plate electrodes alternatively make the electric fields having two different directions which are non-parallel to the direction of the cell passages of the honeycomb structure.

16. The exhaust gas purifying apparatus according to claim 15 characterized in that said honeycomb structure is in a rectangular parallelepiped form, and that said electrodes are positioned on the four outer surfaces thereof which are parallel to the direction of the cell passage.

17. An exhaust gas purifying apparatus according to claim 1, characterized in that the honeycomb structure carries at least one metal selected from the group consisting of an alkali metal and an alkali earth metal.

18. The exhaust gas purifying apparatus according to claim 17 characterized in that said at least one metal is potassium or barium.

19. An exhaust gas purifying apparatus according to claim 1, characterized in that the honeycomb structure carries a material that generates an oxygen radical by conducting an electric current therethrough.

20. The exhaust gas purifying apparatus according to claim 19 characterized in that said material is  $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$ .

21. An exhaust gas purifying apparatus according to claim 1, characterized in that the honeycomb structure carries a manganese dioxide.

22. An exhaust gas purifying apparatus according to claim 1, characterized in that the honeycomb structure carries a material having a high dielectric constant.

23. The exhaust gas purifying apparatus according to claim 22 characterized in that said material is a material having a static specific dielectric constant of more than 100 at the temperature of  $250^\circ\text{C}$ .

24. Th exhaust gas purifying apparatus according to claim 22 characterized in that said material is a barium titanate or strontium titanate.

5 25. An exhaust gas purifying apparatus for trapping and burning PM which comprises electrodes and an insulative honeycomb structure, characterized in that the electrodes make an electric field in said honeycomb structure, and that the honeycomb structure carries at least one metal selected from the group consisting of an  
10 alkali metal and an alkali earth metal.

26. The exhaust gas purifying apparatus according to claim 25 characterized in that said at least one metal is potassium or barium.

15 27. An exhaust gas purifying apparatus for trapping and burning PM which comprises electrodes and an insulative honeycomb structure, characterized in that the electrodes make an electric field in said honeycomb structure, and that the honeycomb structure carries a material that generates an oxygen radical by conducting  
20 an electric current therethrough.

28. The exhaust gas purifying apparatus according to claim 27 characterized in that said material is  $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$ .

25 29. An exhaust gas purifying apparatus for trapping and burning PM which comprises electrodes and an insulative honeycomb structure, characterized in that the electrodes make an electric field in said honeycomb structure, and that the honeycomb structure carries a manganese dioxide.

30 30. An exhaust gas purifying apparatus for trapping and burning PM which comprises electrodes and an insulative honeycomb structure, characterized in that the electrodes make an electric field in said honeycomb structure, and that the honeycomb structure carries a  
35 material having a high dielectric constant.

31. The exhaust gas purifying apparatus according to claim 30 characterized in that said material is a

material having a static specific dielectric constant of more than 100 at the temperatur of 250°C.

32. The exhaust gas purifying apparatus according to claim 30 characterized in that said material is a  
5 barium titanate or strontium titanate.